Occupational Load Carriage: Formal and Informal Conditioning

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Occupational Load Carriage: Formal and Informal Conditioning

By Rob Orr (Bond University: Australia)

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BLUF:

•A well-structured and periodised load carriage conditioning program can reduce the negative impacts of carrying load and optimise operational performance

Introduction:

•Tactical operators are required to carry load as part of their occupation

•Carrying these loads can place the operators at risk through reducing occupational task performance and causing injury




Risks Associated with Load Carriage

'When you get shot at, you move as fast as you can…but it wasn't very fast. You are just tired. So tired.

Justin Kalentis, US Army, wounded in Afghanistan,
discussing the loads they were carrying
quoted in *The Seattle Times* (14 Feb 11)

Risks Associated with Load Carriage

- Injuries: Associated with a variety of injuries (from skin blistering to muscle, ligament, tendon, bone and nervous system injuries)

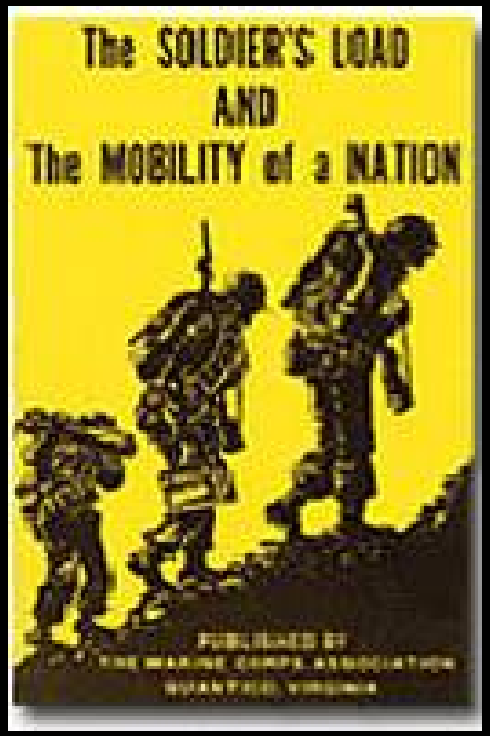
RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
  - ↓ Mobility (Park et al., 2008:2010: Ruby et al., 2003)

Australian Fire Season 2013 – Firestorm moved at speeds of up to 31-37 mi/h

RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
  - ↓ **Mobility**
    - Impacted on battle tactics in major conflicts (Lothian, 1921)



Marshall, S.L.A. (1980)

RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
  - ↓ **Mobility**
    - Impeded mission success (Breen 2000)

RISKS ASSOCIATED WITH LOAD CARRIAGE

- Decrements in performance:
  - ↓ Lethality
    - Marksmanship (Knapik et al., 1990:1991:1997: Rice et al., 1999).

RISKS ASSOCIATED WITH LOAD CARRIAGE

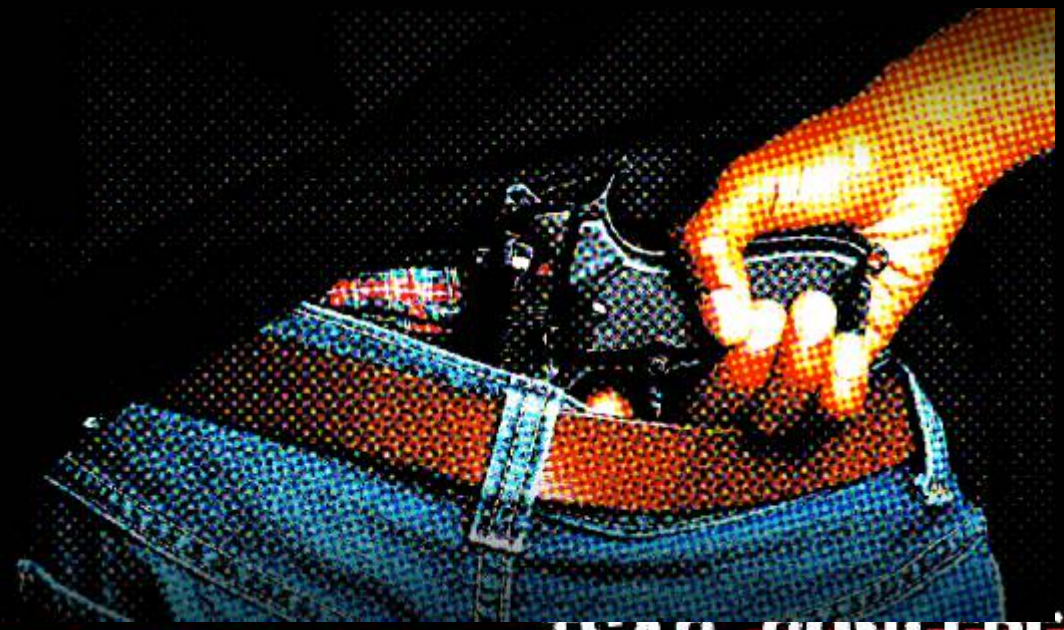
- Decrements in performance:
  - ↓ Lethality
    - Grenade throw distance (Harper et al., 1997: Knapik et al., 1990:1991)

Risks Associated with Load Carriage

- Decrements in performance:
  - ↓ Mobility + ↓ Lethality

Risks Associated with Load Carriage

- Decrements in performance:
  - ↓ Attention to task
    - Alertness: Attention to task: Response to stimuli (Johnson et al., 1995: May et al., 2009: Mahoney et al., 2007)

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Load Carriage Conditioning

- Concept is not new (Flavius Vegetius Renatus - *Epitoma rei militaris)*

Formal Load Carriage Conditioning

Database	Search terms
MEDLINE (Ovid)	load AND carr*; load AND march*; pack AND march*; endurance AND march*
PUBMED	load AND carriage; load AND carry; load AND marching; load AND march; pack AND march; pack AND marching; endurance AND march; endurance AND marching.
PROQUEST	load AND carriage; load AND carry; load AND marching; load AND march; pack AND march; pack AND marching; endurance AND march; endurance AND marching.
CINAHL	load AND carriage OR carry; endurance AND march OR marching; pack AND march OR marching; load AND march OR marching.
DEFWEB	load AND carriage; load AND carry; load AND marching; load AND march; pack AND march; pack AND marching; endurance AND march; endurance AND marching.

Exclusion Criteria	Example:
Participant ages outside typical military service age range of 16 to 65 years	Adolescents
Study included a form of mobility aid	Walking poles
Study included medical supplementation	Ergogenic aids
Study included medically unfit subjects	Idiopathic scoliosis
Study included components in an altered environment	Microgravity, high altitude
Study not published in English	
Study did not include a load carriage variable (dependent or independent); was not specifically related to a load carriage activity; or involved no physical loads being carried	General military conditioning programs
Study had a commercial interest	Commercial backpacks
Defence documents which were rated above "unclassified".	

Orr, et al. (2010)

Load Carriage Conditioning

- **Initial literature search identified 8,053 papers.**
- **Further 36 papers gathered from colleagues.**
- **8089 papers reduced to 214 papers following implementation of exclusion criteria**
- **Secondary literature search reduced papers to seven original research papers, one conference paper and four secondary source papers (military reports, journal articles).**

F.I.T.T Formula (Frequency, Intensity, Time & Type)

- **F. 10-14 days per load carriage session**
- **I. To loads required (Last decade 40-50kg) at the speeds and over the terrains required**
- **T. Duration of load carriage operations**
- **T. Load carriage preferable, but combined resistance and cardio may be of some benefit**

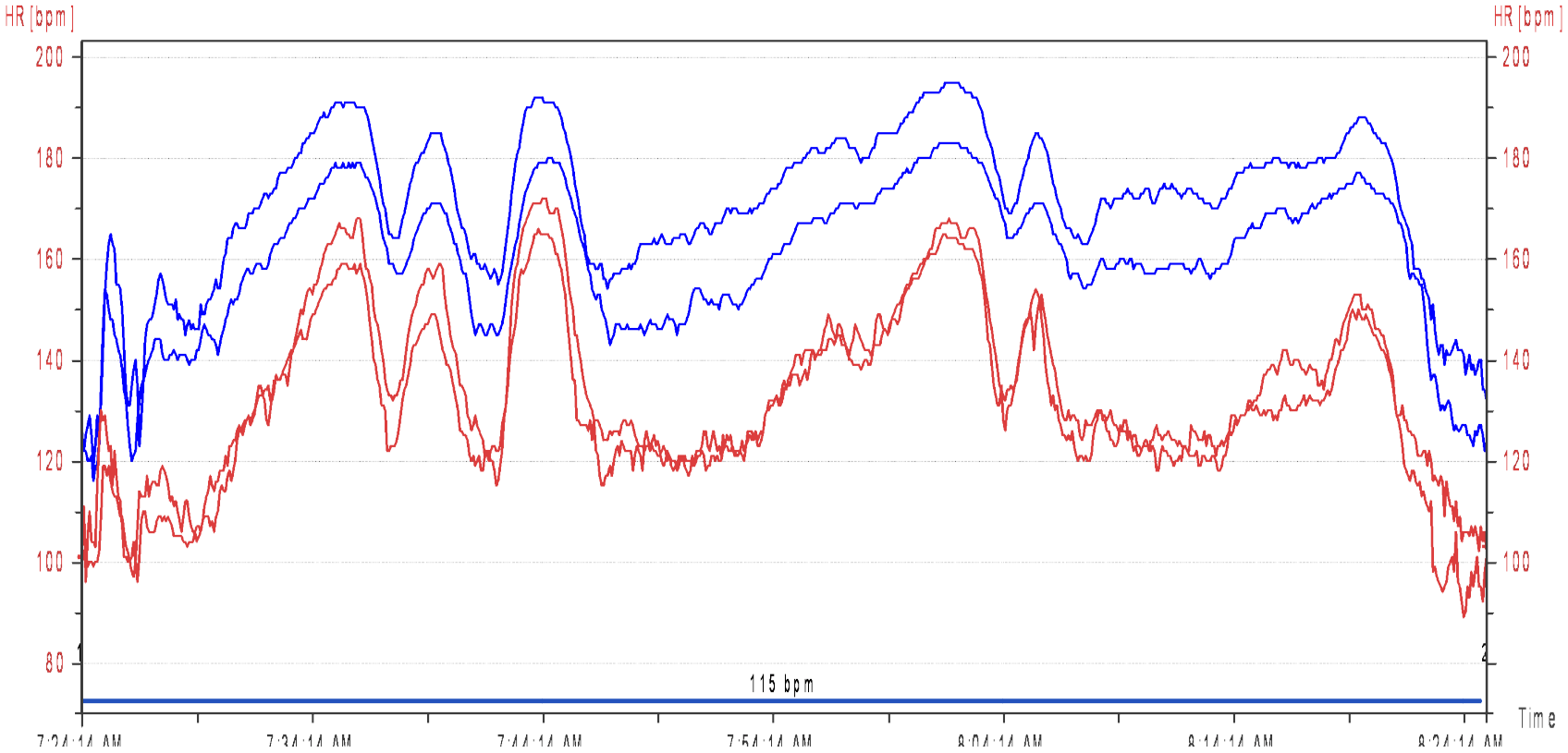
Load Carriage Conditioning

Knapik et al., (2012)

- Method: Review of several literature databases
- Results: 11 Publications from 10 original studies
- Discussion:
  - Substantial trg effect with Progressive RT combined with Aerobic trg (3x4/52)
  - Effects greater when LC added specifically
  - Field based training (inc LC) also very effective
  - RT or Aerobic trg alone had varying effects

Load Carriage Conditioning

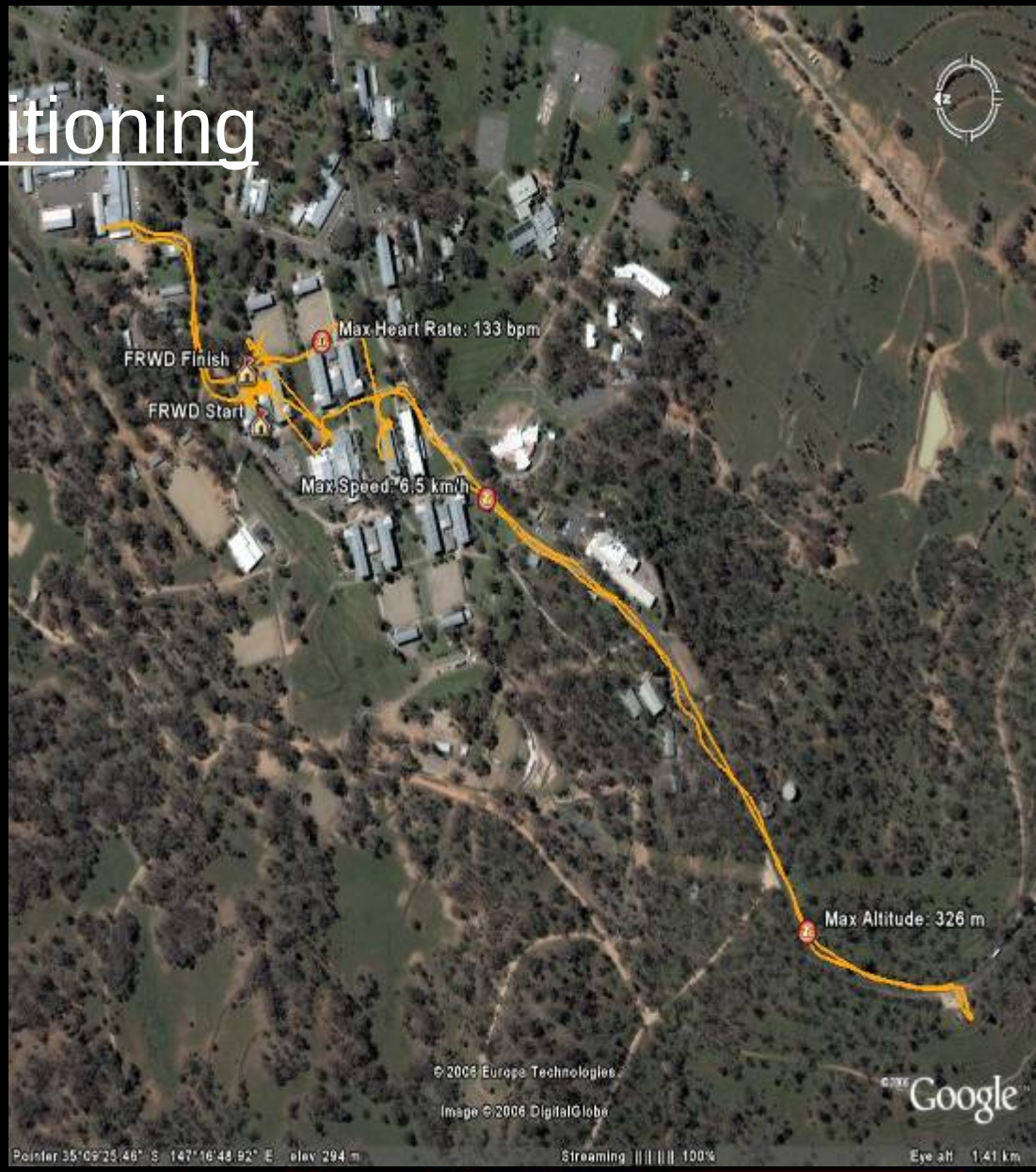
Considering Intensity – Gender / Fitness differences for same given task



Load Carriage Conditioning

Considering Volume – Fitness / background / other tasks

Orr, R. & Moorby, G. (2006)



Load Carriage Conditioning

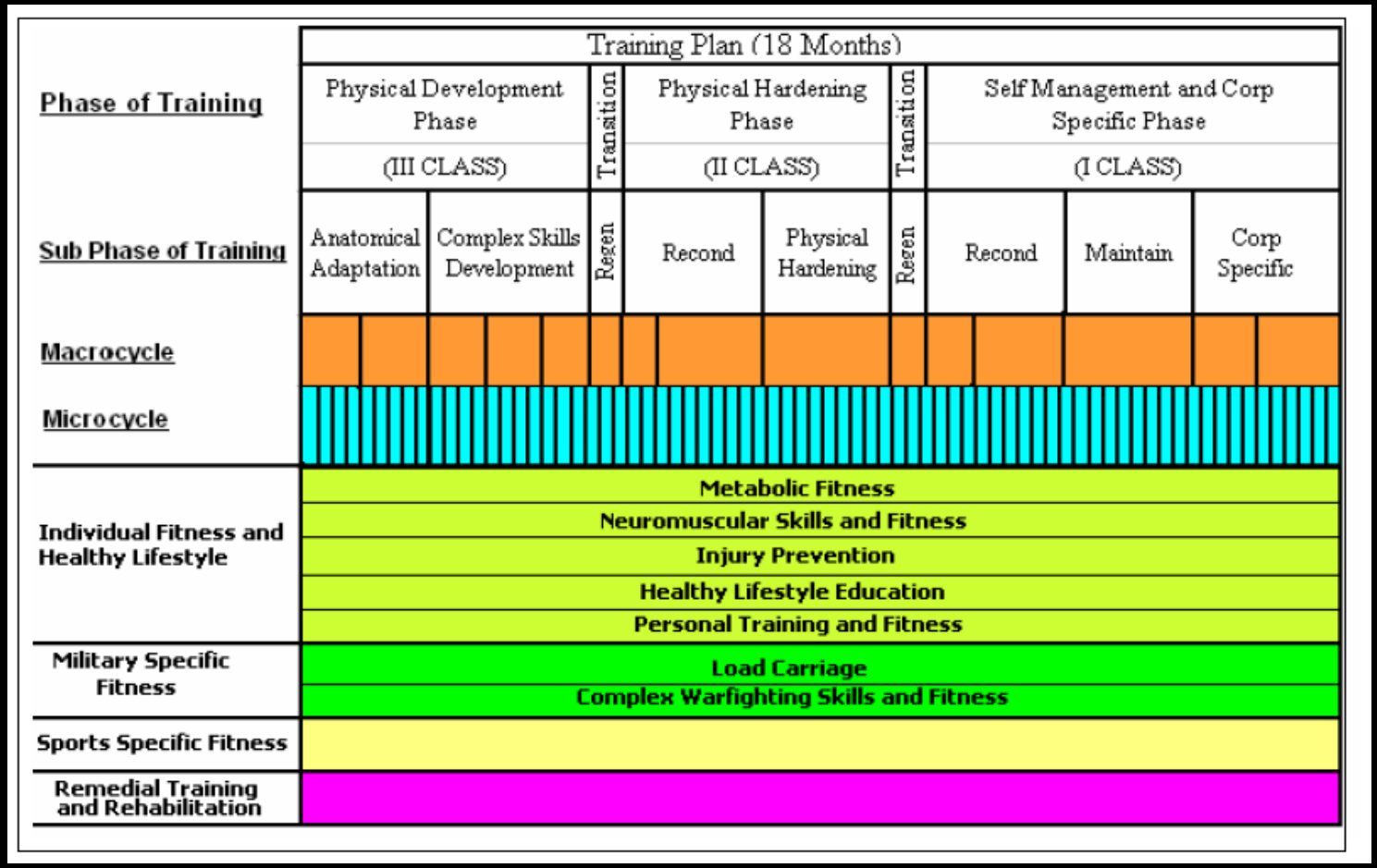
Considering Type - Specificity

Load Carriage Conditioning

Considering Type - Specificity

Load Carriage Conditioning

Integrated Periodisation

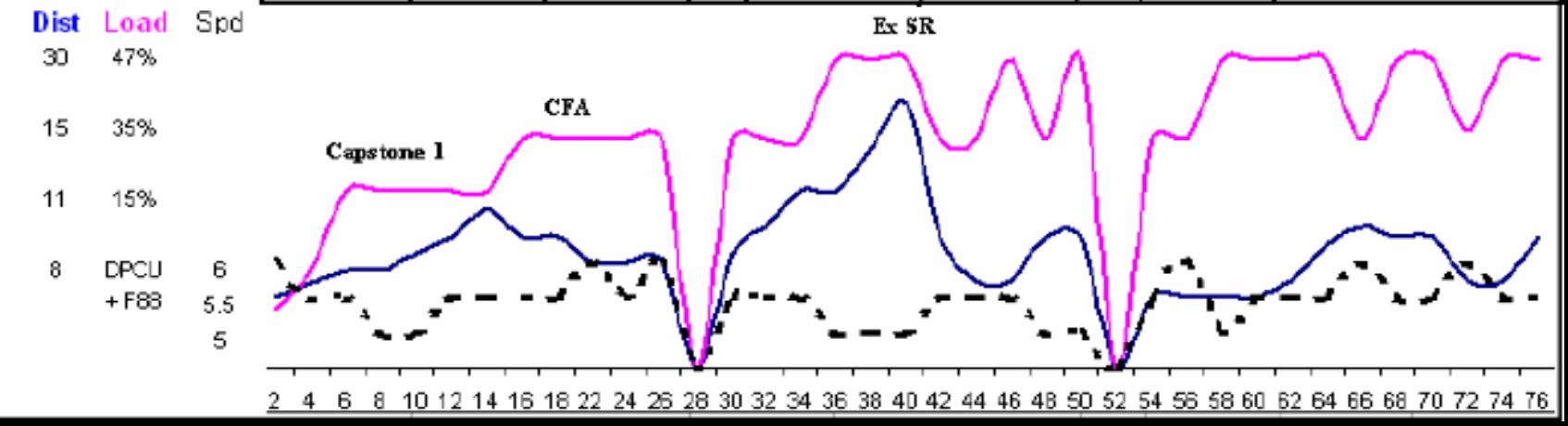


Orr, R. (2010)

Load Carriage Conditioning

Integrated Periodisation – The LCC Plan

Training Plan (18 Months)											
Phase of Training	Physical Development Phase			Transition	Physical Hardening Phase			Transition	Self Management and Corp Specific Phase		
	(III CLASS)				(II CLASS)				(I CLASS)		
Sub Phase of Training	Anatomical Adaptation	Complex Skills Development		Regen	Recond	Physical Hardening		Regen	Recond	Maintain	Corp Specific
Load Carriage Continuum	Volume & Intensity	Volume	Intensity	Active Recovery	Vol & Int	Maint		Active Recovery	Int	Vol & Int	



Orr, R. (2010).

Load Carriage Conditioning

- Informal conditioning

Load Carriage Conditioning

- Informal conditioning - can be used to counter
  - Limited training time

Load Carriage Conditioning

- Informal conditioning - can be used to counter
  - Specific negative impacts associated with load carriage task performance

Load Carriage Conditioning

- Informal conditioning - but must consider what's next.

Take Home:

To improve load carriage performance and reduce the risks associated with load carriage (including injury and reduced tactical performance) a well designed and progressive LC program (including both formal and informal conditioning) is needed.

This program would include specific LC events, preferably ever 7-14 days, progressing to meet with occupational requirements while consider other elements of workplace requirements.

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